JUNE 2018

On-Post
Quarterly Groundwater Monitoring Report

Prepared For

Department of the Army
Camp Stanley Storage Activity
Boerne, Texas

September 2018

EXECUTIVE SUMMARY

- Groundwater samples were collected from 4 on-post drinking water wells scheduled for sampling at Camp Stanley Storage Activity (CSSA) in June 2018.
- CSSA experienced below average precipitation volumes during the 2nd quarter of 2018 and the aquifer experienced a slight decrease from March to June 2018. The weather station (WS) at Area of Concern (AOC)-65 (AOC-65 WS) recorded 4.03 inches of rainfall from April to June, and the B-3 weather station (B-3 WS) was offline for calibration. The average rainfall for the Boerne area from April to June is 11.14 inches.
- At CSSA, the Middle Trinity aquifers' average groundwater elevation in June 2018 decreased 6.03 feet from the elevations measured in March 2018. The average depth to water in the wells was 288.38 feet below top of casing (BTOC) or 953.17 feet above mean sea level (MSL). As such, the Trinity-Glen Rose Groundwater Conservation District (TGRGCD) has moved to Stage 2 conservation measures in June 25, 2018. For the adjacent Edwards aquifer, the San Antonio Water System (SAWS) has also moved to Stage 2 water restrictions implemented June 11, 2018.
- The maximum contaminant level (MCL) for VOCs was not exceeded in any wells sampled in June 2018.
- No wells sampled had metal detections above their corresponding MCL, action level (AL), or secondary standard (SS) in June 2018.
- No Westbay Well zones were scheduled for sampling in June 2018. However, these wells were profiled to capture water level data for the area.
- All samples collected in June 2018 were in accordance with the 2015 long term monitoring optimization (LTMO) report that has been approved by the TCEQ and USEPA.

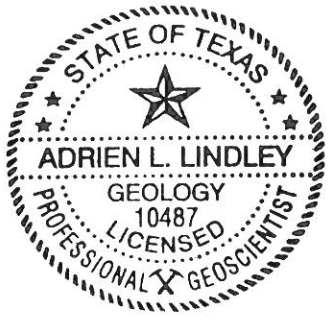
GEOSCIENTIST CERTIFICATION

JUNE 2018 ON-POST QUARTERLY GROUNDWATER MONITORING REPORT

FOR

DEPARTMENT OF THE ARMY
CAMP STANLEY STORAGE ACTIVITY
BOERNE, TEXAS

I, Adrien Lindley, Professional Geologist (P.G.), hereby certify that the June 2018 On-Post Quarterly Groundwater Monitoring Report for the Camp Stanley Storage Activity installation in Boerne, Texas accurately represents the site conditions of the subject area. This certification is limited only to geoscientific products contained in the subject report and is made on the basis of written and oral information provided by the CSSA Environmental Office, laboratory data provided by APPL Laboratories, and field data obtained during groundwater monitoring conducted at the site in June 2018 and is true and accurate to the best of my knowledge and belief.



Adrien Lindley, P.G.
State of Texas
Geology License No. 10487

9/13/2018
Date

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ACRONYMS AND ABBREVIATIONS

µg/L	microgram per liter
§3008(h) Order	RCRA 3008(h) Administrative Order on Consent
AL	Action Level
AOC	Area of Concern
APPL	Agriculture and Priority Pollutants Laboratories, Inc.
BS	Bexar Shale
BTOC	below top of casing
CC	Cow Creek
cis-1,2-DCE	*cis*-1,2-Dichloroethene
COC	constituents of concern
CSSA	Camp Stanley Storage Activity
DQO	Data Quality Objectives
HSP	Health and Safety Plan
ISCO	In-Situ Chemical Oxidation
LGR	Lower Glen Rose
LTMO	Long-Term Monitoring Optimization
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MSL	mean sea level
NA	Not Available
PCE	Tetrachloroethene
P.G.	Professional Geologist
Parsons	Parsons Government Services, Inc.
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
SAP	Sampling and Analysis Plan
SAWS	San Antonio Water System
SS	Secondary Standard
SWMU	Solid Waste Management Units
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TGRGCD	Trinity-Glen Rose Groundwater Conservation District
UGR	Upper Glen Rose
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WS	Weather Station

JUNE 2018
GROUNDWATER MONITORING REPORT
CAMP STANLEY STORAGE ACTIVITY, TEXAS

1.0 INTRODUCTION

This report presents results from the on-post quarterly sampling performed at Camp Stanley Storage Activity (CSSA) in June 2018. Laboratory analytical results are presented along with potentiometric contour maps. Results from all four 2018 quarterly monitoring events (March, June, September, and December) will be described in detail in the 2018 Annual Report. The Annual Report will also provide an interpretation of all analytical results and an evaluation of any temporal or spatial trends observed in the groundwater contaminant plume during investigations. For this specific quarter, groundwater monitoring was performed June 6-15, 2018 by Parsons Government Services, Inc. (Parsons).

Current objectives of the groundwater monitoring program are to determine groundwater flow direction and elevations, determine groundwater contaminant concentrations for characterization purposes, and identify meteorological and seasonal variations in physical and chemical properties. **Appendix A** identifies the data quality objectives (DQOs) for CSSA's groundwater monitoring program, along with an evaluation of whether each DQO was attained. The objectives listed in **Appendix A** also reference appropriate sections of the Resource Conservation and Recovery Act (RCRA) **§3008(h) Administrative Order on Consent** [§3008(h) Order].

The CSSA groundwater monitoring program follows the provisions of the groundwater monitoring program DQOs as well as the recommendations of the **Three-Tiered Long Term Monitoring Network Optimization (LTMO) Evaluation (Parsons, 2015)** which provided recommendations for sampling based on an LTMO study performed for the CSSA groundwater monitoring program. The LTMO evaluation was updated in 2015 using groundwater data from monitoring conducted between 2010 and 2015. The proposed LTMO changes/updates were approved by the TCEQ and USEPA April 22 and May 5, 2016, respectively. These changes were briefed to the public in the 2016 Annual Fact Sheet. The updated LTMO study sampling frequencies were implemented in December 2016.

2.0 POST-WIDE FLOW DIRECTION AND GRADIENT

After a year of below average rainfall in 2017 followed by approximately 9 inches of rain through June 2018, the aquifer has returned to drought conditions. The San Antonio Water System (SAWS) restrictions moved from 'year-round watering hours' to Stage 1 water restrictions on May 21, 2018. Less than a month later Stage 2 water restrictions were declared on June 11, 2018. The Trinity-Glen Rose Groundwater Conservation District (TGRGCD) moved from Stage 1 water restrictions to Stage 2 on June 25, 2018.

The 30-year precipitation normal for the San Antonio area for the three-month period of April through June is 11.14 inches of rainfall. Over the 3-month period of record, the weather station (WS) at AOC-65 (AOC-65 WS), recorded 4.03 inches of rainfall (0.51 inches in April, 2.79 inches in May, and 0.73 inches in June). One day had a daily rainfall total in excess of 1 inch at AOC-65, May 4th. The weather station at B-3 (B-3 WS) was down for calibration April 2 – May 22, 2018 therefore a complete set of data was not recorded for this quarter.

Fifty-six water level measurements were recorded on June 15, 2018 from on- and off-post monitoring wells completed in the Lower Glen Rose (LGR), Bexar Shale (BS), and Cow Creek (CC) formational members of the Middle Trinity Aquifer (**Tables 2.1 and 2.2**). The groundwater potentiometric surface maps illustrating groundwater elevations from the LGR, BS, and CC zones in June 2018 are shown in **Figures 2.1, 2.2, and 2.3**, respectively.

The June 2018 potentiometric surface map for LGR-screened wells **(Figure 2.1)** exhibited a wide range of groundwater elevations, from a minimum of 889.18 feet above mean sea level (MSL) at CS-MW11A-LGR to a maximum of 1010.04 feet above MSL at CS-MWG-LGR. Groundwater elevations are generally higher in the northern and central portions of CSSA, and decrease to the southeast. As measured in all non-pumping wells, the average groundwater elevation in June 2018 decreased 6.00 feet from the average groundwater elevation measured in March 2018 to 945.99. This is 82.16 feet below the 15.5-year average groundwater elevation for the area (1028.15 feet) (**Figure 2.4**).

Well CS-MW4-LGR, located in the central portion of CSSA, typically has one of the highest groundwater elevations of LGR-screened wells. During average and above-average aquifer elevations, the groundwater level is 20 to 30 feet higher than the nearest comparable wells (CS-MW2-LGR and CS-MW5-LGR), creating a pronounced groundwater mound in the central portion of the facility. Long-term monitoring has ascertained that when groundwater near CS-MW4-LGR rises above about 970 feet MSL, the mounding effect is evident. In June 2018, mounding was not observed as the groundwater elevation at CS-MW4-LGR was lower than at CS-MW2-LGR (969.44 and 970.83 feet MSL, respectively), and only 3 feet higher than CS-MW5-LGR (966.62 feet MSL).

Table 2.1
Measured Groundwater Elevation
June 2018

Well ID:	TOC elevation (ft MSL)	Depth to Groundwater (ft BTOC)	Groundwater Elevation (ft MSL)	Formations Screened			Date
				LGR	BS	CC	
CS-1	1169.27	272.61	896.66	**ALL**			6/15/2018
CS-2	**1237.59**	**257.48**	**980.11**	**X**	**?**		6/15/2018
CS-3	1240.17	263.84	976.33	**X**			6/15/2018
CS-4	1229.28	253.90	975.38	**X**			6/15/2018
CS-10	**1331.51**	**383.24**	**948.27**	**ALL**			6/15/2018
CS-12	**1274.09**	**289.16**	**984.93**	**ALL**			6/15/2018
CS-13	**1193.26**	**286.93**	**906.33**	**ALL**			6/15/2018
CS-D	1236.03	257.53	978.50	**X**			6/15/2018
CS-MWG-LGR	1328.14	318.10	1010.04	**X**			6/15/2018
CS-MWH-LGR	1319.19	313.84	1005.35	**X**			6/15/2018
CS-I	1315.20	309.44	1005.76	**X**			6/15/2018
CS-MW1-LGR	1220.73	247.27	973.46	**X**			6/15/2018
CS-MW1-BS	1221.09	245.02	976.07		**X**		6/15/2018
CS-MW1-CC	1221.39	260.39	961.00			**X**	6/15/2018
CS-MW2-LGR	1237.08	266.25	970.83	**X**			6/15/2018
CS-MW2-CC	1240.11	276.65	963.46			**X**	6/15/2018
CS-MW3-LGR	1334.14	356.21	977.93	**X**			6/15/2018
CS-MW4-LGR	1209.71	240.27	969.44	**X**			6/15/2018
CS-MW5-LGR	1340.24	373.62	966.62	**X**			6/15/2018
CS-MW6-LGR	1232.25	297.41	934.84	**X**			6/15/2018
CS-MW6-BS	1232.67	258.45	974.22		**X**		6/15/2018
CS-MW6-CC	1233.21	311.17	922.04			**X**	6/15/2018
CS-MW7-LGR	1202.27	278.67	923.60	**X**			6/15/2018
CS-MW7-CC	1201.84	290.82	911.02			**X**	6/15/2018
CS-MW8-LGR	1208.35	278.80	929.55	**X**			6/15/2018
CS-MW8-CC	1206.13	292.81	913.32			**X**	6/15/2018
CS-MW9-LGR	1257.27	271.00	986.27	**X**			6/15/2018
CS-MW9-BS	1256.73	268.68	988.05		**X**		6/15/2018
CS-MW9-CC	1255.95	293.65	962.30			**X**	6/15/2018
CS-MW10-LGR	1189.53	296.87	892.66	**X**			6/15/2018
CS-MW10-CC	1190.04	304.95	885.09			**X**	6/15/2018
CS-MW11A-LGR	1204.03	314.85	889.18	**X**			6/15/2018
CS-MW11B-LGR	1203.52	208.25	995.27	**X**			6/15/2018
CS-MW12-LGR	1259.07	288.47	970.60	**X**			6/15/2018
CS-MW12-BS	1258.37	280.45	977.92		**X**		6/15/2018
CS-MW12-CC	1257.31	294.37	962.94			**X**	6/15/2018
CS-MW16-LGR	1244.60	266.02	978.58	**X**			6/15/2018
CS-MW16-CC*	1244.51	341.33	903.18			**X**	6/15/2018
B3-EXW01	1245.26	271.22	974.04	**X**			6/15/2018
B3-EXW02	1249.66	275.66	974.00	**X**			6/15/2018
B3-EXW03	1235.11	261.78	973.33	**X**			6/15/2018
B3-EXW04	1228.46	252.82	975.64	**X**			6/15/2018
B3-EXW05	1279.46	304.45	975.01	**X**			6/15/2018
CS-MW17-LGR	1257.01	323.62	933.39	**X**			6/15/2018
CS-MW18-LGR	1283.61	345.00	938.61	**X**			6/15/2018
CS-MW19-LGR	1255.53	302.18	953.35	**X**			6/15/2018
CS-MW20-LGR	1209.42	256.77	952.65	**X**			6/15/2018
CS-MW21-LGR	1184.53	251.76	932.77	**X**			6/15/2018
CS-MW22-LGR	1280.49	365.60	914.89	**X**			6/15/2018
CS-MW23-LGR	1258.20	341.11	917.09	**X**			6/15/2018
CS-MW24-LGR	1253.90	274.60	979.30	**X**			6/15/2018
CS-MW25-LGR	1293.01	308.76	984.25	**X**			6/15/2018
CS-MW35-LGR	1186.97	295.90	891.07	**X**			6/15/2018
CS-MW36-LGR	1218.74	286.47	932.27	**X**			6/15/2018
CS-MW37-LGR	1205.83	308.55	897.28	**X**			6/15/2018
FO-20	1327.00	297.53	1029.47		**ALL**		6/15/2018
Number of wells screened in each formation.				**38**	**4**	**9**	
Average groundwater elevation in each formation given in feet (non pumping wells).				**951.76**	**979.07**	**935.15**	

Notes:

Bold wells: CS-2, CS-10, CS-12, CS-13, and FO-20 are open boreholes across more than one formational unit.

? = Exact screening information unknown for this well.

Shaded wells are routinely pumped for either domestic, livestock, or environmental remediation purposes, and therefore are not used in calculating statistics.

CS-1, CS-10, CS-12, and CS-13 are current or future drinking water wells.

CS-MW16-LGR, CS-MW16-CC, B3-EXW01 through B3-EXW05 pumps are cycling continuously to feed the B-3 Bioreactor.

* = submersible pump running at time of water level measurement.

Formational average groundwater elevation is calculated from non-pumping wells screened in only one formation.

All measurements given in feet.

NA = Data not available

Table 2.2
Change in Groundwater Elevation from Previous Quarter
June 2018

Well ID	Mar. 2018 Elevations	Jun. 2018 Elevations	GW elevation change (June minus Mar.)	Formations Screened		
				LGR	BS	CC
CS-1	905.17	896.66	-8.51	ALL		
CS-2	**980.17**	**980.11**	**-0.06**	**X**	**?**	
CS-3	979.57	976.33	-3.24	**X**		
CS-4	977.59	975.38	-2.21	**X**		
CS-10	**951.21**	**948.27**	**-2.94**	**ALL**		
CS-12	**996.63**	**984.93**	**-11.70**	**ALL**		
CS-13	**897.29**	**906.33**	**9.04**	**ALL**		
CS-D	980.68	978.50	-2.18	**X**		
CS-MWG-LGR	1020.76	1010.04	-10.72	**X**		
CS-MWH-LGR	1021.17	1005.35	-15.82	**X**		
CS-I	1014.17	1005.76	-8.41	**X**		
CS-MW1-LGR	976.16	973.46	-2.70	**X**		
CS-MW1-BS	975.01	976.07	1.06		**X**	
CS-MW1-CC	970.55	961.00	-9.55			**X**
CS-MW2-LGR	974.00	970.83	-3.17	**X**		
CS-MW2-CC	965.08	963.46	-1.62			**X**
CS-MW3-LGR	981.34	977.93	-3.41	**X**		
CS-MW4-LGR	987.09	969.44	-17.65	**X**		
CS-MW5-LGR	969.84	966.62	-3.22	**X**		
CS-MW6-LGR	945.21	934.84	-10.37	**X**		
CS-MW6-BS	963.89	974.22	10.33		**X**	
CS-MW6-CC	926.86	922.04	-4.82			**X**
CS-MW7-LGR	930.77	923.60	-7.17	**X**		
CS-MW7-CC	916.69	911.02	-5.67			**X**
CS-MW8-LGR	939.22	929.55	-9.67	**X**		
CS-MW8-CC	918.95	913.32	-5.63			**X**
CS-MW9-LGR	991.22	986.27	-4.95	**X**		
CS-MW9-BS	990.48	988.05	-2.43		**X**	
CS-MW9-CC	986.23	962.30	-23.93			**X**
CS-MW10-LGR	901.29	892.66	-8.63	**X**		
CS-MW10-CC	892.73	885.09	-7.64			**X**
CS-MW11A-LGR	897.23	889.18	-8.05	**X**		
CS-MW11B-LGR	dry	995.27	NA	**X**		
CS-MW12-LGR	974.33	970.60	-3.73	**X**		
CS-MW12-BS	976.55	977.92	1.37		**X**	
CS-MW12-CC	978.62	962.94	-15.68			**X**
CS-MW16-LGR	980.67	978.58	-2.09	**X**		
CS-MW16-CC*	909.91	903.18	-6.73			**X**
B3-EXW01	977.68	974.04	-3.64	**X**		
B3-EXW02	977.28	974.00	-3.28	**X**		
B3-EXW03	975.31	973.33	-1.98	**X**		
B3-EXW04	978.23	975.64	-2.59	**X**		
B3-EXW05	977.64	975.01	-2.63	**X**		
CS-MW17-LGR	936.80	933.39	-3.41	**X**		
CS-MW18-LGR	942.43	938.61	-3.82	**X**		
CS-MW19-LGR	957.05	953.35	-3.70	**X**		
CS-MW20-LGR	958.27	952.65	-5.62	**X**		
CS-MW21-LGR	935.86	932.77	-3.09	**X**		
CS-MW22-LGR	912.44	914.89	2.45	**X**		
CS-MW23-LGR	921.69	917.09	-4.60	**X**		
CS-MW24-LGR	981.80	979.30	-2.50	**X**		
CS-MW25-LGR	988.57	984.25	-4.32	**X**		
CS-MW35-LGR	899.66	891.07	-8.59	**X**		
CS-MW36-LGR	942.47	932.27	-10.20	**X**		
CS-MW37-LGR	905.13	897.28	-7.85	**X**		
FO-20	**1052.14**	**1029.47**	**-22.67**	**ALL**		
Average groundwater elevation change (all wells minus pumping wells)			**-6.03**			
Average groundwater elevation change in each formation (non pumping wells)				**-5.74**	**2.58**	**-9.32**

Notes:

Bold wells: CS-2, CS-10, CS-12, CS-13, and FO-20 are open boreholes across more than one formational unit.

? = Exact screening information unknown for this well.

Shaded wells are routinely pumped for either domestic, livestock, or environmental remediation purposes, and therefore are not used in calculating statistics.

CS-1, CS-9, CS-10, CS-12, and CS-13 are current, inactive, or future drinking water wells.

CS-MW16-LGR, CS-MW16-CC, B3-EXW01 through B3-EXW05 pumps are cycling continuously to feed the B-3 Bioreactor.

* = submersible pump running at time of water level measurement.

Formational average groundwater elevation change is calculated from non-pumping wells screened in only one formation.

All measurements given in feet.

NA = Data not available

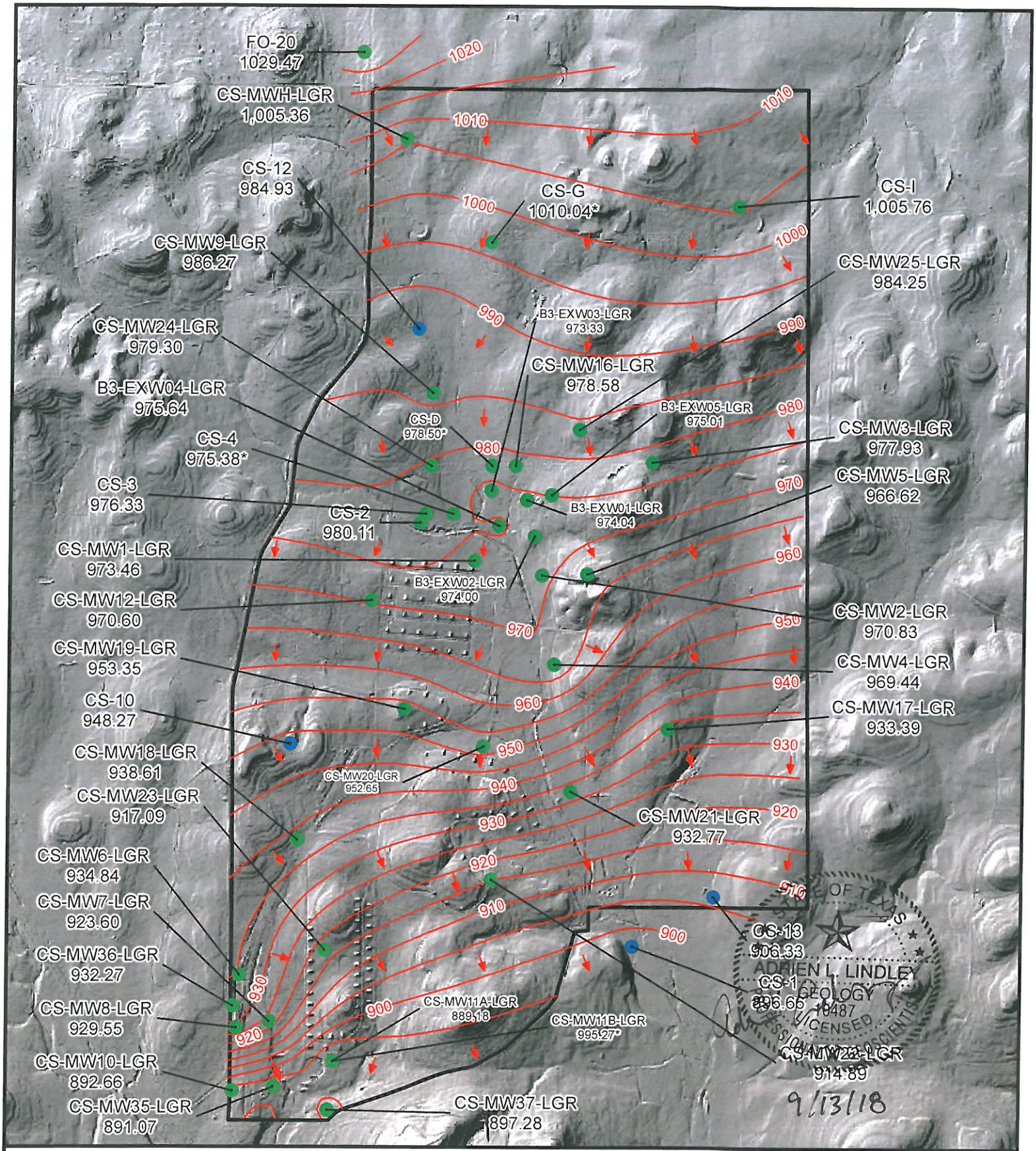


Figure 2.1

June 2018 Potentiometric Surface Map, LGR Wells

Camp Stanley Storage Activity

PARSONS

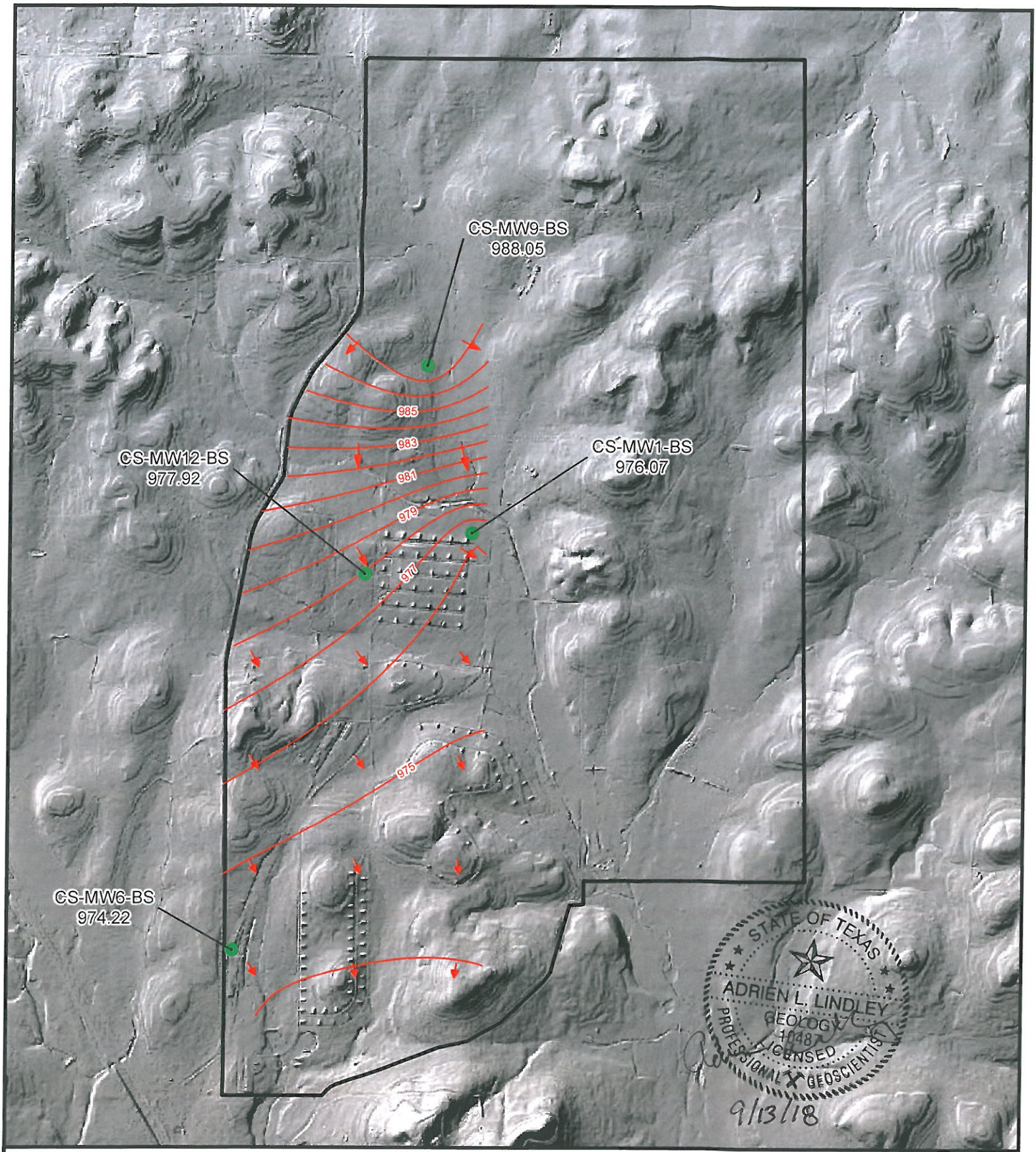


Figure 2.2

June 2018 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

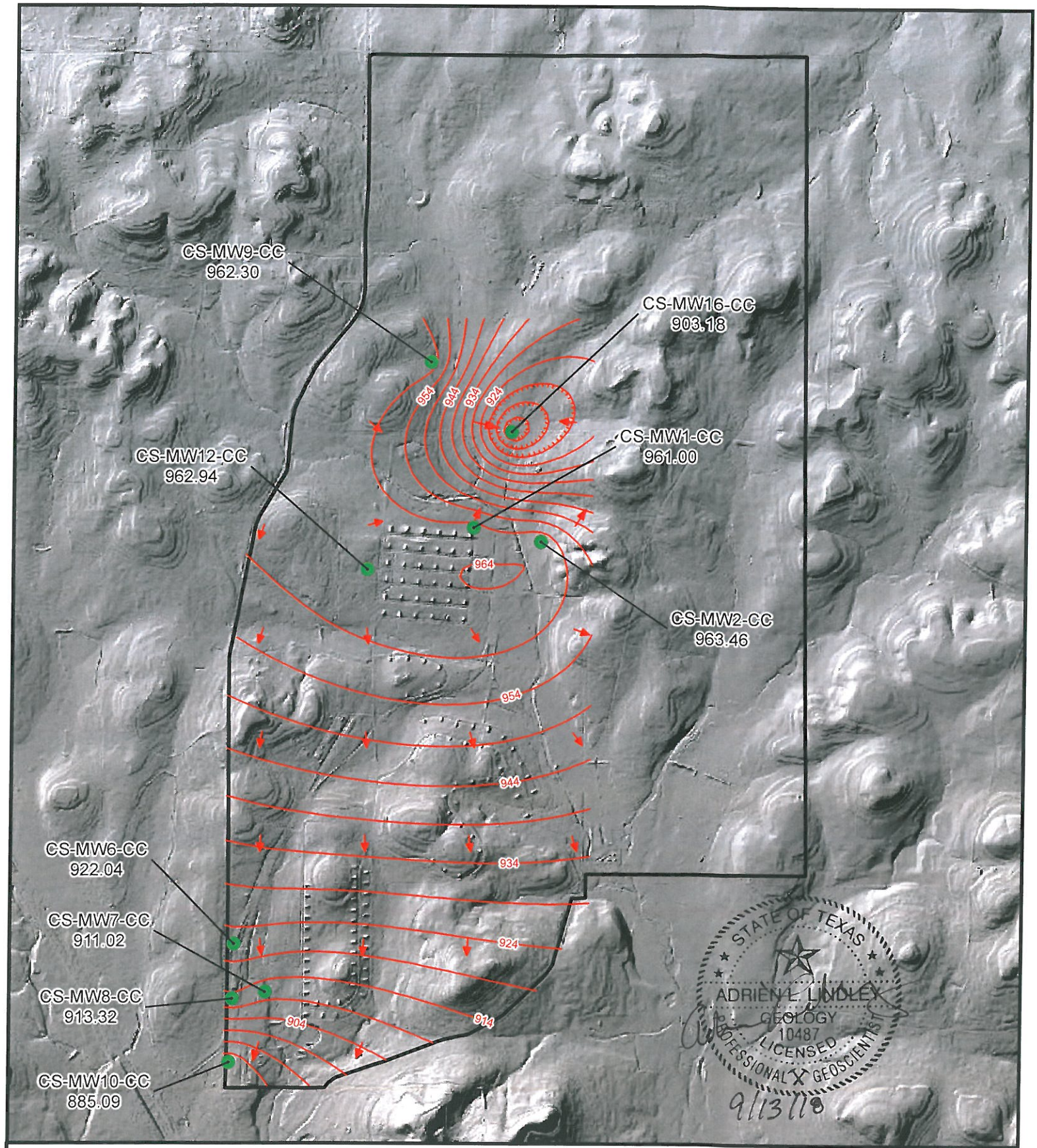


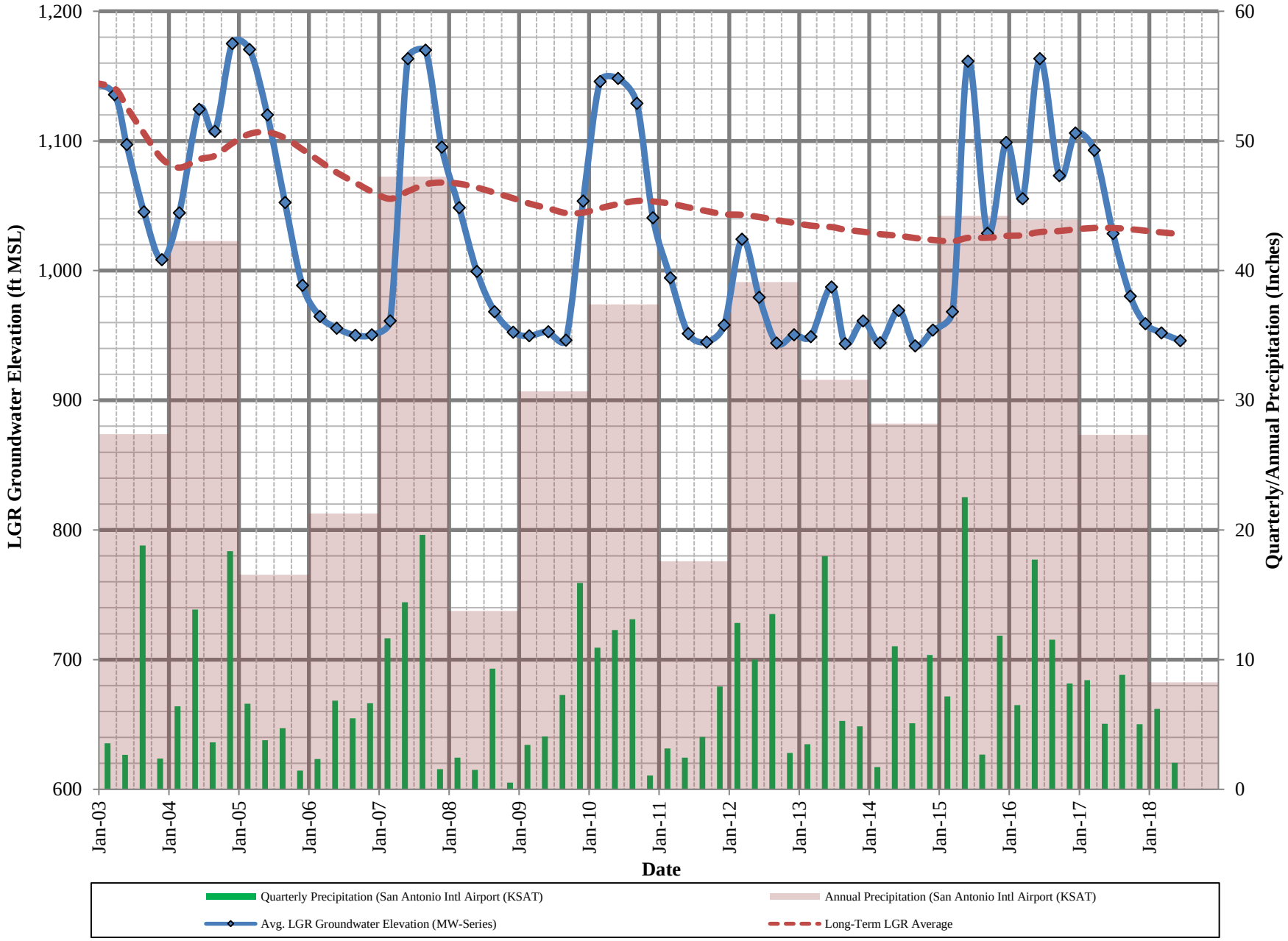
Figure 2.3

June 2018 Potentiometric Surface Map, CC Wells

Camp Stanley Storage Activity

PARSONS

Figure 2.4 - Average LGR Groundwater Elevations and Quarterly/Annual Precipitation



It should be noted that well pumping on and around CSSA affects the potentiometric surface. On-post wells CS-MW16-LGR, CS-MW16-CC, B3-EXW01, B3-EXW02, B3-EXW03, B3-EXW04, and B3-EXW05 are cyclically pumped as part of the Bioreactor remediation system at Solid Waste Management Unit (SWMU) B-3. These remediation wells provide groundwater to the Bioreactor system, and are automatically operated based upon water level within each well and availability within the storage tanks. Influences from the pumping of the Bioreactor wells B3-EXW01 through B3-EXW05 are manifested as "cones of depression". The typical "cone of depression" is not observed in the June 2018 LGR potentiometric surface map, however, recent examples of this phenomenon are observed in March, June and December 2017. The Bioreactor cone of depression is induced into the aquifer to extract contaminated water within its direct zone of influence, and otherwise retard the flow of the groundwater that cannot be directly captured by the extraction wells away from the site.

CSSA drinking water wells CS-1, CS-10, CS-12, and CS-13 are also cycled on and off to maintain the drinking water system currently in place at CSSA. Off-post water supply wells along Ralph Fair Road may also exert a subtle influence to gradients along the western and southern boundaries of the post. The northern end of CSSA exhibits a fairly uniform southerly gradient and becomes a more steeply-sloped south-southeasterly gradient in the southern portion of the post.

Historical groundwater monitoring at CSSA has demonstrated that the aquifer gradient typically slopes in a south-southeast direction; however, variable aquifer levels and well-pumping scenarios can affect the localized and regional gradients (**Figure 2.1**). Pumping action at wells CS-1, CS-10, CS-12, CS-13, CS-MW16-LGR/CC, B3-EXW01 through B3-EXW05, CS-MWH-LGR, CS-I, and even off-post wells (Fair Oaks Ranch) can significantly alter the LGR groundwater gradient. The regional gradient calculation, an overall groundwater gradient averaged across CSSA, is measured from CS-MWH-LGR to CS-1 (0.0067895 ft/ft) indicating a southerly flow. In the North Pasture, groundwater from CS-H flows towards CS-MW2-LGR at a gradient of 0.0039493 ft/ft (south-southeast). At the southern end of the camp a south-southeasterly gradient of 0.0130562 ft/ft was present between CS-MW4-LGR and CS-1.

Under normal conditions, the potentiometric surface in both the BS and CC members of the aquifer generally trend in a southerly direction, like the LGR. But during periods of above-average water levels or intense aquifer recharge, a strongly dominant eastward component in both the BS and CC is often observed. In June 2018, the average groundwater elevation of the BS was 979.07 feet MSL, and groundwater flow is mainly to the south with a slight eastward component in the central portion of the post (**Figure 2.2**).

A review of historical data has shown that the CC potentiometric surface develops a predominantly easterly gradient when the average CC groundwater elevation is higher than 995 feet MSL. Below that elevation, the gradient resumes a more southerly direction as is the case in June 2018 where the average groundwater elevation from non-pumping wells was 935.15 feet MSL. In the northern portion of the post, a well-defined cone depression is observed around the Bioreactor extraction well, CS-MW16-CC, interrupting the typical southerly gradient. That well is used for continuous groundwater extraction for the SWMU B-3 Bioreactor system. When present, the cone of depression from pumping at CS-MW16-CC can interrupt the typical flow patterns within the CC and BS (**Figure 2.3**).

Groundwater elevations have been measured and recorded since 1992. Previous droughts resulted in water levels decreasing substantially in 1996, 1999, 2000, 2006, 2008, 2009, 2011 through 2014. In 2015, approximately 44 inches of rainfall in the San Antonio area ended the drought cycle, resulting in a net gain of 145 feet in aquifer level over the course of the year. In 2017, approximately 28 inches of rainfall was recorded in the San Antonio area, about 4 inches below the 30-year annual average. Below average rainfall in the first two quarters of 2018 allowed the aquifer to continue its decline. By the end of June 2018, the post wide average level in the LGR wells decreased 6 feet from March 2018. With this decrease, the June 2018 LGR groundwater average elevation (945.99 feet MSL) is now 82.16 feet below the long-term (15.5 year) average groundwater elevation (1,028.15 feet MSL).

It is worth noting that, based on more than 15.5 years of program history, the postwide LGR groundwater level has declined by 117.19 feet (see **Figure 2.4**). As can be expected with sparse data sets, the largest rate of change/decline (90 feet) came during the initial 4 years of the groundwater monitoring program. Over the past 10 years, the average decline rate has subdued, losing an additional 31.93 feet of average groundwater elevation. This 10-year period included 7 years of prolonged drought and three years of above average precipitation (2010, 2015, and 2016). The past 15.5-year history of CSSA groundwater monitoring indicates that the aquifer level is "below average" approximately 67 percent of the time. Over the last three years (12 monitoring events), the aquifer has been "below average" 42 percent of the time including the last five monitoring events (June, September, and December 2017, and March and June 2018). Above average groundwater elevations have been recorded only eight times in the past 31 monitoring events (7.75 years). Prior to June 2015, the LGR had not been above the long-term "average" water elevation since September 2010.

3.0 JUNE ANALYTICAL RESULTS

3.1 Monitoring Wells

Under the provisions of the groundwater monitoring DQOs and the 2015 LTMO evaluation, the schedule for sampling on-post in June 2018 included 4 wells. The samples included four production wells: CS-1, CS-10, CS-12, and CS-13 (see **Table 3.1)**. In conjunction with the off-post monitoring initiative (under a separate report) the June 2018 groundwater sampling constituted a "quarterly" event as outlined in the 2015 LTMO updated schedule, which was implemented in December 2016.

All 4 wells scheduled for monitoring in June 2018 were sampled. Additional samples were collected as part of the AOC-65 in-situ chemical oxidation (ISCO) and SWMU B-3 bioreactor Corrective Measures operations; these results will be documented in separate reports. **Tables 3.1** and **3.2** provide a sampling overview for June 2018 and the schedule under the LTMO recommendations. The wells listed in **Table 3.1** are sampled using dedicated low-flow gas-operated bladder pumps. Wells CS-1, CS-10, CS-12, and CS-13 were sampled using dedicated electric submersible pumps. **Figure 3.1** shows well sampling locations.

Wells sampled by low-flow pumps were purged until the field parameters of pH, temperature, and conductivity stabilized. The on-post monitoring wells were sampled in June 2018 for volatile organic compounds (VOCs) analytes which include *cis*-1,2-dichloroethene (*cis*-1,2-DCE), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride. Effective in September 2016 per the recently-approved DQOs, metals are no longer obtained from on-post monitoring wells. Metals analyses will continue to be collected from active groundwater remediation sites (AOC-65 and B-3), as well as on-post drinking water wells. As such, active drinking water wells CS-1, CS-10, CS-12, and CS-13 were analyzed for the same VOC analytes and metals (arsenic, barium, chromium, copper, zinc, cadmium, mercury, and lead).

Samples were analyzed by Agriculture & Priority Pollutant Laboratories (APPL) in Clovis, California. All detected concentrations of VOCs and metals are presented in **Table 3.3**. Full analytical results are presented in **Appendix B**.

No wells sampled this quarter had VOCs detected above the PCE and/or TCE Maximum Contaminant Level (MCL) of 5 micrograms per liter (µg/L). A comparison of VOC concentrations versus water level for select wells is presented in **Figure 3.2**. The overall trend for CS-D, CS-4, CS-MW1-LGR, CS-MW5-LGR, CS-MW36-LGR last sampled in June 2017 was a slight decrease in VOC concentrations with a decrease in groundwater elevation. CS-MW5-LGR has been sampled since 2001, but it did not show concentrations of PCE and TCE above the MCL until December 2015. This quarter the overall groundwater elevation in all wells indicates the aquifer is experiencing drought conditions. Wells presented in **Figure 3.2** are sampled every 15 months according to the current LTMO, with the next scheduled event occurring in September 2018.

Table 3.1
Overview of the On-Post Monitoring Program

Count	Well ID	*Analytes*	*Last Sample Date*	*Sep-17*	*Dec-17*	*Mar-18*	*Jun-18*	*Sampling Frequency**
	CS-MW1-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW1-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW1-CC	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW2-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW2-CC	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW3-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW4-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW5-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW6-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW6-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW6-CC	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW7-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW7-CC	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW8-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW8-CC	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW9-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW9-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW9-CC	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW10-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW10-CC	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW11A-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW11B-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW12-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW12-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW12-CC	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CW-MW17-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW18-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW19-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
1	CS-1	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-18	S	S	S	S	Quarterly
	CS-2	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-4	VOCs	Jun-17	NS	NS	NS	NS	15 months
2	CS-10	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-18	S	S	S	S	Quarterly
3	CS-12	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-18	S	S	S	S	Quarterly
4	CS-13	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-18	S	S	S	S	Quarterly
	CS-D	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MWG-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MWH-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-I	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW20-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW21-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW22-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW23-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW24-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW25-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW35-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-MW36-LGR	VOCs	Jun-17	NS	NS	NS	NS	15 months
	CS-MW37-LGR	VOCs	Mar-18	S	S	S	NS	15 months

* New LTMO sampling frequency to be implemented in December 2016
S = Sample
NS = No Sample
NSWL = No Sample due to low water level

Table 3.2 Westbay Sampling Frequency

Westbay Interval	Last Sample Date	Sep-17	Dec-17	Mar-18	Jun-18	LTMO Sampling Frequency (as of Dec. 2016)
CS-WB01-UGR-01	Dec-04	NS	NS	NS	NS	15 months
CS-WB01-LGR-01	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-02	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-03	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-04	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-05	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-06	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-07	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-08	Jun-17	NS	NS	NS	NS	15 months
CS-WB01-LGR-09	Jun-17	NS	NS	NS	NS	15 months
CS-WB02-UGR-01	Dec-04	NS	NS	NS	NS	15 months
CS-WB02-LGR-01	Dec-14	NS	NS	NS	NS	15 months
CS-WB02-LGR-02	Mar-10	NS	NS	NS	NS	15 months
CS-WB02-LGR-03	Jun-17	NS	NS	NS	NS	15 months
CS-WB02-LGR-04	Jun-17	NS	NS	NS	NS	15 months
CS-WB02-LGR-05	Jun-17	NS	NS	NS	NS	15 months
CS-WB02-LGR-06	Jun-17	NS	NS	NS	NS	15 months
CS-WB02-LGR-07	Jun-17	NS	NS	NS	NS	15 months
CS-WB02-LGR-08	Jun-17	NS	NS	NS	NS	15 months
CS-WB02-LGR-09	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-UGR-01	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-01	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-02	Oct-07	NS	NS	NS	NS	15 months
CS-WB03-LGR-03	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-04	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-05	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-06	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-07	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-08	Jun-17	NS	NS	NS	NS	15 months
CS-WB03-LGR-09	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-UGR-01	Mar-04	NS	NS	NS	NS	15 months
CS-WB04-LGR-01	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-02	Mar-14	NS	NS	NS	NS	15 months
CS-WB04-LGR-03	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-04	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-06	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-07	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-08	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-09	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-10	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-LGR-11	Jun-17	NS	NS	NS	NS	15 months
CS-WB04-BS-01	Jun-17	NS	NS	NS	NS	30 months
CS-WB04-BS-02	Jun-17	NS	NS	NS	NS	30 months
CS-WB04-CC-01	Jun-17	NS	NS	NS	NS	30 months
CS-WB04-CC-02	Jun-17	NS	NS	NS	NS	30 months
CS-WB04-CC-03	Jun-17	NS	NS	NS	NS	30 months

Profiling performed quarterly, in conjunction with post wide water levels.
S = Sample
NS = No Sample
NSWL = No sample due to low water level

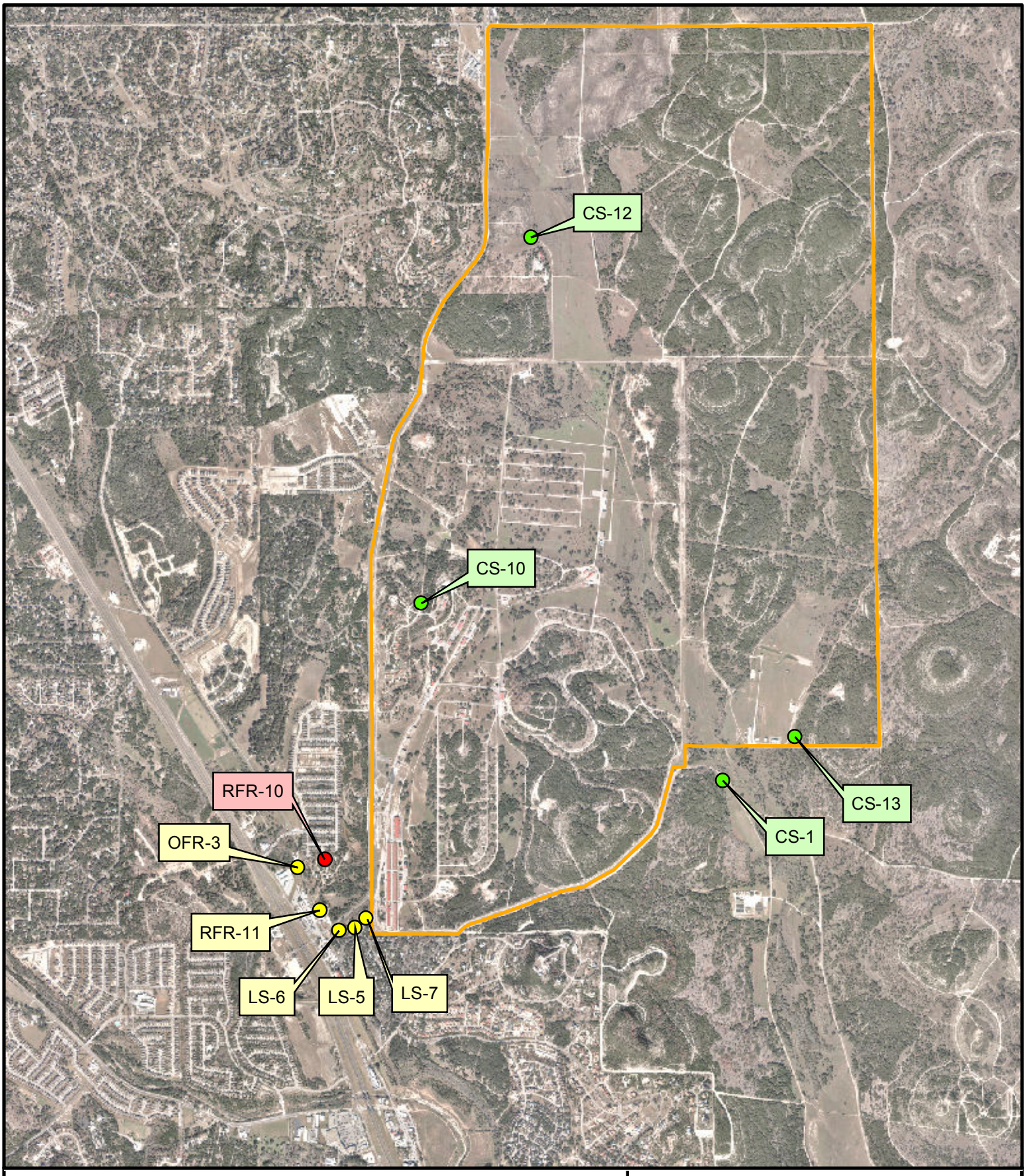


Figure 3-1

On-Post and Off-Post Well Sampling Locations for June 2018

Camp Stanley Storage Activity

PARSONS

Table 3.3
June 2018 On-Post Quarterly Groundwater Results, Detected Analytes

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CSSA Drinking Water Well System									
CS-1	6/11/2018	--	**0.0383**	--	**0.0017F**	**0.008F**	**0.0031F**	**0.19**	--
CS-10	6/11/2018	--	**0.0414**	--	**0.0018F**	**0.025**	**0.0095F**	**0.629**	--
CS-12	6/11/2018	--	**0.0342**	--	**0.0012F**	--	--	**0.051**	--
CS-12 FD	6/11/2018	--	**0.0327**	--	**0.0019F**	**0.021**	**0.0024F**	**0.042F**	--
CS-13	6/11/2018	--	**0.0315**	--	**0.0023F**	--	--	**0.487**	--
Comparison Criteria									
Method Detection Limit (MDL)		**0.00022**	**0.0003**	**0.0005**	**0.001**	**0.003**	**0.0019**	**0.008**	**0.0001**
Reporting Limit (RL)		**0.03**	**0.005**	**0.007**	**0.01**	**0.01**	**0.025**	**0.05**	**0.001**
Max. Contaminant Level (MCL)		**0.01**	**2**	**0.005**	**0.1**	**AL=1.3**	**AL=0.015**	**SS=5.0**	**0.002**

Well ID	Sample Date	cis-1,2-DCE	PCE	TCE	Vinyl Chloride
CSSA Drinking Water Well System					
CS-1	6/11/2018	--	--	--	--
CS-10	6/11/2018	--	--	--	--
CS-12	6/11/2018	--	--	--	--
CS-12 FD	6/11/2018	--	--	--	--
CS-13	6/11/2018	--	--	--	--
Comparison Criteria					
Method Detection Limit (MDL)		**0.07**	**0.06**	**0.05**	**0.08**
Reporting Limit (RL)		**1.2**	**1.4**	**1**	**1.1**
Max. Contaminant Level (MCL)		**70**	**5**	**5**	**2**

BOLD	≥ MDL
BOLD	≥ RL
BOLD	≥ MCL

Precipitation per Quarter:	Mar-18
AOC-65 Weather Station (AOC-65 WS)	4.91
B-3 Weather Station (B-3 WS)	5.72

All samples were analyzed by APPL, Inc.
VOC data reported in ug/L & metals data reported in mg/L.

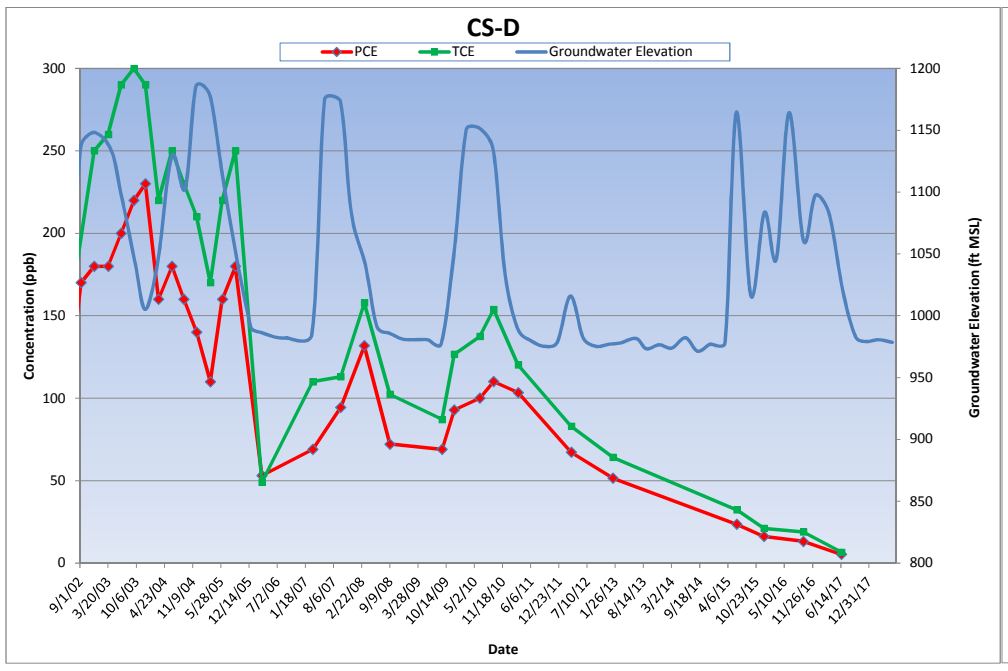
Abbreviations/Notes:

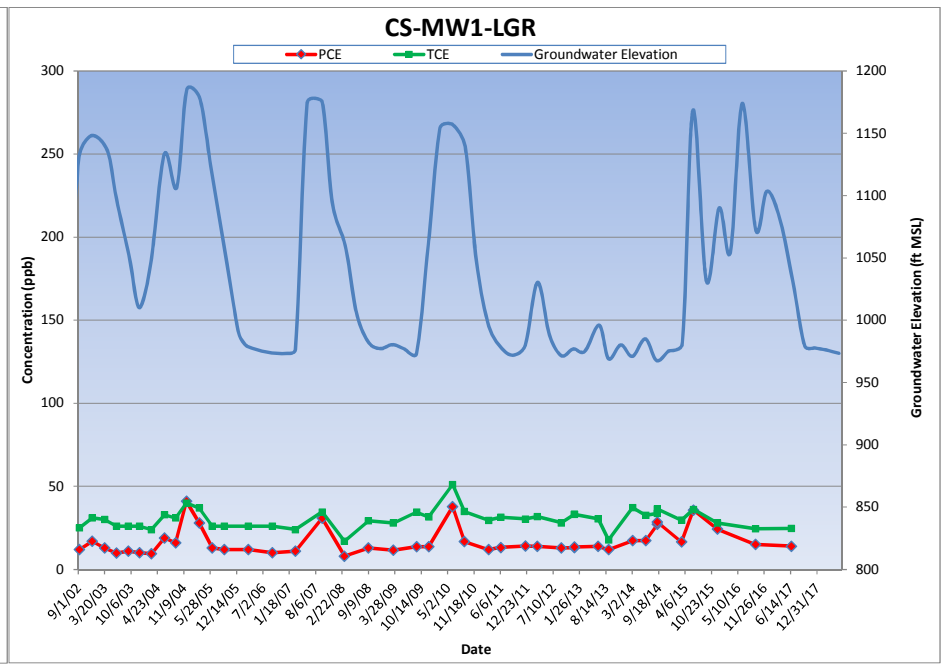
FD	Field Duplicate
TCE	Trichloroethene
PCE	Tetrachloroethene
DCE	Dichloroethene
AL	Action Level
SS	Secondary Standard

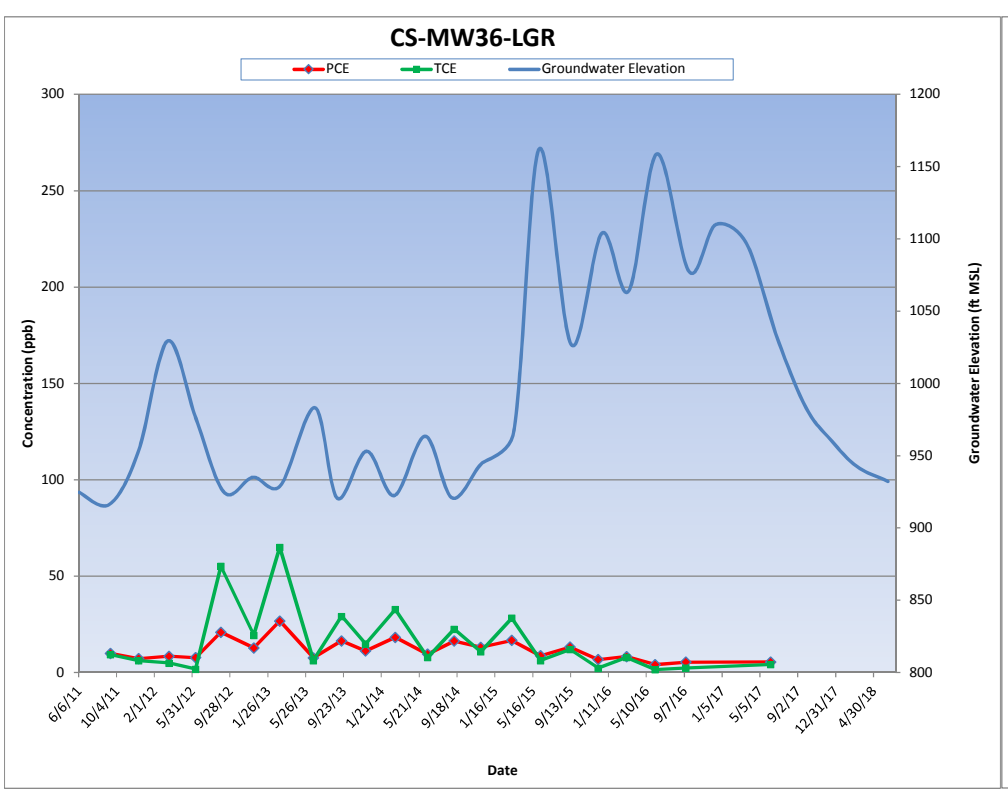
Data Qualifiers:

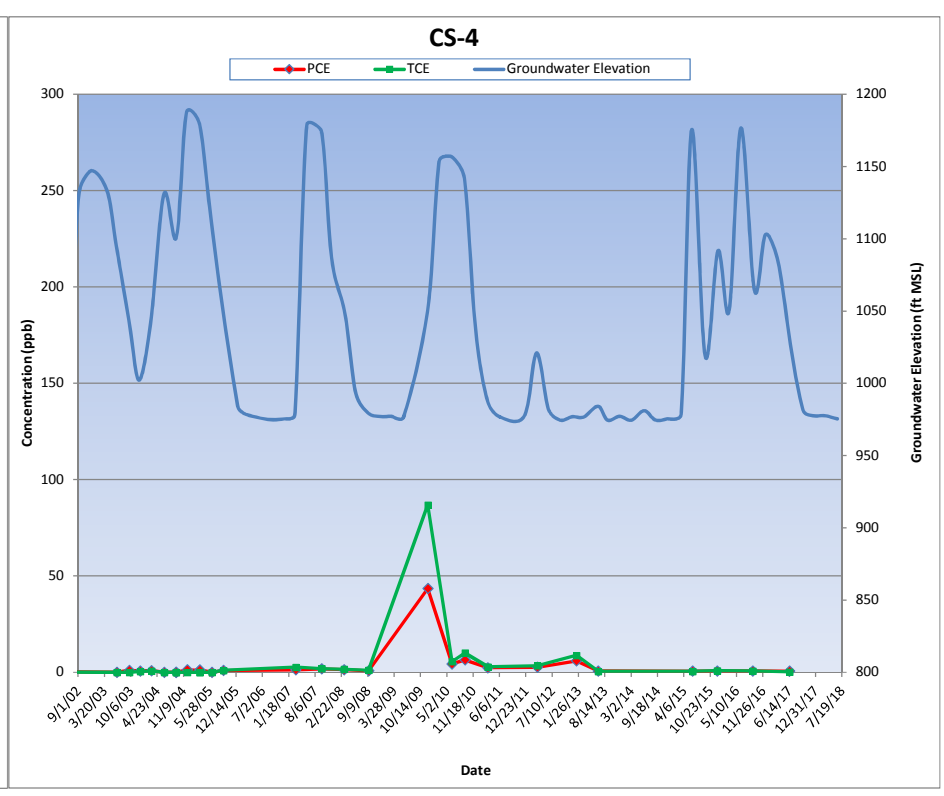
--The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.
F-The analyte was positively identified but the associated numerical value is below the RL.
J - Analyte detected, concentration estimated.
NA - data not available

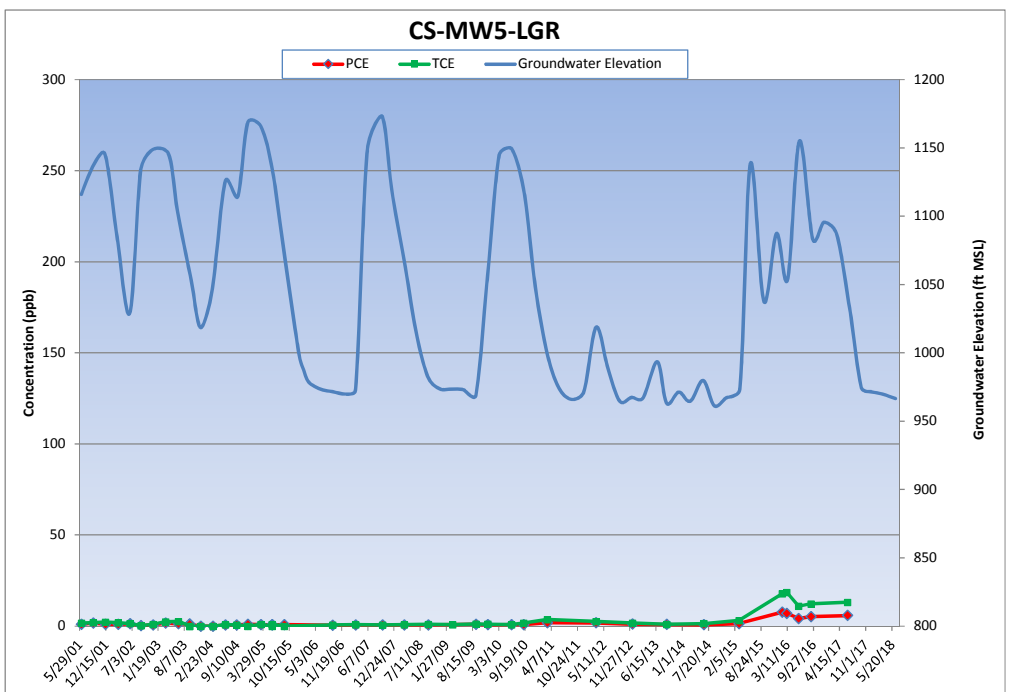
Figure 3.2
On-Post Cumulative Analytical vs. Groundwater Elevation











NOTE: Sampling dates are indicated by the squares on the trend line.

Results from on-post monitoring wells are considered definitive data and are subject to data validation and verification under provisions of the CSSA Quality Assurance Project Plan (QAPP). Parsons data package numbered 110093-#6 containing the analytical results from this sampling event, were received by Parsons July 10, 2018. Data validation was conducted and the data validation reports are presented in **Appendix C**.

3.2 Westbay-equipped Wells

The recently updated LTMO schedule was implemented in December 2016. In June 2018, no Westbay Well zones were scheduled for sampling. However, these wells (CS-WB01, CS-WB02, CS-WB03, and CS-WB04) were profiled to capture water level readings. These Westbay wells are located in the vicinity of AOC-65, and are part of the post-wide quarterly groundwater monitoring program. Per the recently-approved 2015 LTMO, the Upper Glen Rose (UGR)/LGR zones are to be sampled on a 15-month schedule and the BS/CC zones are sampled on a 30-month schedule. The sampling of these wells began in September 2003.

There are four other Westbay wells (CS-WB05, CS-WB06, CS-WB07, and CS-WB08) that are located at the SWMU B-3 remediation site. Those wells are sampled on a separate schedule in association with the SWMU B-3 bioreactor monitoring. Results for those wells are presented in the SWMU B-3 Performance Status Reports.

4.0 JUNE 2018 SUMMARY

- Groundwater samples were collected from 4 on-post wells scheduled for monitoring in June 2018 at Camp Stanley Storage Activity (CSSA).
- From April 1st to June 30, 2018, CSSA's AOC-65 weather station recorded 4.03 inches of rainfall and the SWMU B-3 weather station was offline for calibration. The rainfall was sporadic with 0.51 inches falling in April, 2.79 inches falling in May, and 0.73 inches in June from AOC-65 weather station. One event (May 4th) had greater than one inch of daily rainfall.
- The Middle Trinity aquifer levels (LGR, BS, and CC) decreased an average of 6.03 feet per non-pumping well since last quarter. The average water level in June 2018 (excluding pumping wells) was 288.38 feet BTOC (953.17 feet MSL).
- No VOCs were detected above the MCL in June 2018 (**Table 3.3**).
- There were no metals detected above the MCL/AL/SS in the wells sampled in June 2018.
- Westbay Wells 01-04 were not sampled in June 2018. However, these well were profiled to capture water level data in the area.

APPENDIX A

EVALUATION OF DATA QUALITY OBJECTIVES ATTAINMENT

Appendix A Evaluation of Data Quality Objectives Attainment

Activity	Objectives	Action	Objective Attained?	Recommendations
Field Sampling	Conduct field sampling in accordance with procedures defined in the project work plan, SAP, QAPP, HSP, and LTMO recommendations.	All sampling was conducted in accordance with the procedures described in the project plans.	Yes.	NA
Characterization of Environmental Setting (Hydrogeology)	Prepare water-level contour and/or potentiometric maps for each formation of the Middle Trinity Aquifer (3.5.3).	Potentiometric surface maps were prepared based on water levels measured in each of CSSA's wells screened in three formations on June 15, 2018.	To the extent possible with data available. Due to the limited data available and the fact that wells are completed across multiple water-bearing units, potentiometric maps should only be used for regional water flow direction, not local. Ongoing pumping in the CSSA area likely affects the natural groundwater flow direction.	As additional wells are installed screened in distinct formations, future evaluations will eliminate reliance on wells screened across multiple formations.
	Describe the flow system, including the vertical and horizontal components of flow (2.1.9).	Potentiometric maps were created using June 15, 2018 water level data, and horizontal flow direction was tentatively identified. Insufficient data are currently available to determine vertical component of flow.	As described above, due to the lack of aquifer-specific water level information, potentiometric surface maps should only be used as an estimate of regional flow direction.	Same as above.
	Define formation(s) in the Middle Trinity Aquifer are impacted by the VOC contaminants (2.1.3).	Quarterly groundwater monitoring provides information on Middle Trinity Aquifer impacts. Monitoring wells equipped with Westbay® - multi-port samplers are sampled every 15 or 30 months.	Yes.	Continue sampling.

Activity	Objectives	Action	Objective Attained?	Recommendations
Characterization of Environmental Setting (Hydrogeology) (Continued)	Identify any temporal changes in hydraulic gradients due to seasonal influences (2.1.5).	Downloaded data from continuous-reading transducers in wells: CS-MW4-LGR, CS-MW9-LGR, CS-MW12-LGR, CS-MW12-CC, and CS-MW10-CC. Additional continuous reading transducers were added to the program through the SCADA project. The following wells can be uploaded to see real time water level data: CS-MW16-LGR, CS-MW16-CC, CS-1, CS-12, CS-13, and CS-10. Data was also downloaded from the AOC-65 and B-3 weather stations. Water levels will be graphed at these wells against precipitation data through December 2018 and included in the annual groundwater report.	Yes.	Continue collection of transducer data and possibly install transducers in other cluster wells.
Contamination Characterization (Ground Water Contamination)	Characterize the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the Facility (3.1.2).	Samples for laboratory analysis were collected from all 4 CSSA on-post drinking water wells. The 4 BS wells are no longer sampled as part of the groundwater program.	The horizontal and vertical extent of groundwater contamination is continuously monitored.	Continue groundwater monitoring and construct additional wells as necessary.
	Determine the horizontal and vertical concentration profiles of all constituents of concern (COC) in the groundwater that are measured by USEPA-approved procedures (3.1.2). COCs are those chemicals that have been detected in groundwater in the past and their daughter (breakdown) products.	Groundwater samples were collected from wells: CS-1, CS-10, CS-12, and CS-13. Samples were analyzed for the short list of VOCs using USEPA method SW8260B. The drinking water wells were also sampled for metals (arsenic, barium, chromium, copper, cadmium, mercury, lead, and zinc). Analyses were conducted in accordance with the CSSA QAPP and approved variances. All reporting limits (RL) were below MCLs, as listed below:	Yes.	Continue sampling.

Activity	Objectives	Action	Objective Attained?	Recommendations
Contamination Characterization (Ground Water Contamination) (Continued)	Determine the horizontal and vertical concentration profiles of all constituents of concern (COC) in the groundwater that are measured by USEPA-approved procedures (3.1.2). COCs are those chemicals that have been detected in groundwater in the past and their daughter (breakdown) products.	**ANALYTE** / **RL (µg /L)** / **MCL(µg/L)** *cis*-1,2-DCE: 1.2 / 70 PCE: 1.4 / 5 TCE: 1.0 / 5 Vinyl chloride: 1.1 / 2	Yes.	Continue sampling.
		ANALYTE / **RL (µg/L)** / **MCL/AL (µg /L)** Barium: 5 / 2,000 Chromium: 10 / 100 Copper: 10 / 1,300 Zinc: 50 / 5,000 Arsenic: 30 / 10 Cadmium: 7 / 5 Lead: 25 / 15 Mercury: 1 / 2	Yes.	Continue sampling.
	Meet CSSA QAPP quality assurance requirements.	Samples were analyzed in accordance with the CSSA QAPP and approved variances. Parsons chemists verified all data.	Yes.	NA
		All data flagged with a "U," "J," "M," and "F" are usable for characterizing contamination. All "R" flagged data are considered unusable.	Yes.	NA

Activity	Objectives	Action	Objective Attained?	Recommendations
Contamination Characterization (Ground Water Contamination) (Continued)	Meet CSSA QAPP quality assurance requirements. (Continued)	Previously, a method detection limit (MDL) study for arsenic, cadmium, and lead was not performed within a year of the analyses, as required by the AFCEE QAPP.	The laboratory performed new MDL studies in February 2001 for these metals and the new MDL values were found to be almost identical to the previous MDLs and all met the associated AFCEE QAPP requirements. MDLs for these three metals are well below MCLs. In addition, the laboratory performed daily calibrations and RL verifications for these metals, both of which demonstrate the laboratory's ability to detect and quantitate these metals at RL levels. These daily analyses also indicate that concentrations above the laboratory RL for these compounds were not affected by the expired MDL study.	Use results for groundwater characterization purposes.
Remediation	Determine goals and create cost-effective and technologically appropriate methods for remediation (2.2.1).	Continued data collection will provide analytical results for accomplishing this objective.	Ongoing.	Continue sampling and evaluation, including quarterly groundwater monitoring teleconferences to address remediation.
	Determine placement of new wells for monitoring (2.3.1, 3.6)	Sampling frequency and sample locations to be monitored (including any new wells) will be based on trend data from monitoring event(s) (3.1.5).	Ongoing.	Continue quarterly groundwater teleconferences to discuss sampling frequency and placement of new monitor wells.
Project schedule/ Reporting	Produce a quarterly monitoring project schedule as a road map for sampling, analysis, validation, verification, reviews, and reports.	Prepare schedules and sampling guidelines prior to each quarterly sampling event.	Yes.	Continue sampling schedule preparation each quarter.

APPENDIX B

QUARTERLY ON-POST GROUNDWATER MONITORING ANALYTICAL RESULTS JUNE 2018

Appendix B
Quarterly On-Post Groundwater Monitoring Analytical Results, June 2018

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CSSA Drinking Water Well System									
CS-1	6/11/2018	0.00022U	**0.0383**	0.0005U	**0.0017F**	**0.008F**	**0.0031F**	**0.19**	0.0001U
CS-10	6/11/2018	0.00022U	**0.0414**	0.0005U	**0.0018F**	**0.025**	**0.0095F**	**0.629**	0.0001U
CS-12	6/11/2018	0.00022U	**0.0342**	0.0005U	**0.0012F**	0.003U	0.0019U	**0.051**	0.0001U
CS-12 FD	6/11/2018	0.00022U	**0.0327**	0.0005U	**0.0019F**	**0.021**	**0.0024F**	**0.042F**	0.0001U
CS-13	6/11/2018	0.00022U	**0.0315**	0.0005U	**0.0023F**	0.003U	0.0019U	**0.487**	0.0001U
Comparison Criteria									
Method Detection Limit (MDL)		**0.00022**	**0.0003**	**0.0005**	**0.001**	**0.003**	**0.0019**	**0.008**	**0.0001**
Reporting Limit (RL)		**0.03**	**0.005**	**0.007**	**0.01**	**0.01**	**0.025**	**0.05**	**0.001**
Max. Contaminant Level (MCL)		**0.01**	**2**	**0.005**	**0.1**	**AL=1.3**	**AL=0.015**	**SS=5.0**	**0.002**

Well ID	Sample Date	cis-1,2-DCE	PCE	TCE	Vinyl Chloride
CSSA Drinking Water Well System					
CS-1	6/11/2018	0.07U	0.06U	0.05U	0.08U
CS-10	6/11/2018	0.07U	0.06U	0.05U	0.08U
CS-12	6/11/2018	0.07U	0.06U	0.05U	0.08U
CS-12 FD	6/11/2018	0.07U	0.06U	0.05U	0.08U
CS-13	6/11/2018	0.07U	0.06U	0.05U	0.08U
Comparison Criteria					
Method Detection Limit (MDL)		**0.07**	**0.06**	**0.05**	**0.08**
Reporting Limit (RL)		**1.2**	**1.4**	**1**	**1.1**
Max. Contaminant Level (MCL)		**70**	**5**	**5**	**2**

BOLD	≥ MDL
BOLD	≥ RL
BOLD	≥ MCL

All samples were analyzed by APPL, Inc.
VOC data reported in ug/L & metals data reported in mg/L.

Abbreviations/Notes:

FD	Field Duplicate
TCE	Trichloroethene
PCE	Tetrachloroethene
DCE	Dichloroethene
AL	Action Level
SS	Secondary Standard

Data Qualifiers:

F-The analyte was positively identified but the associated numerical value is below the RL.
J - Analyte detected, concentration estimated.
NA - data not available

APPENDIX C
DATA VALIDATION REPORT

SDG 86005

DATA VERIFICATION SUMMARY REPORT

for groundwater samples collected from

CAMP STANLEY STORAGE ACTIVITY

BOERNE, TEXAS

Data Verification by: Sandra de las Fuentes
Parsons - Austin

INTRODUCTION

The following data verification summary report covers four water samples and the associated field quality control (QC) samples collected from Camp Stanley Storage Activity (CSSA) on June 11, 2018. The samples were assigned to the following Sample Delivery Group (SDG).

86005

The samples were analyzed for the following parameters: volatile organic compounds by SW8260B, metals by SW6010B, and mercury by SW7470A. The field QC samples associated with this SDG was one field duplicate (FD), one set of matrix spike/matrix spike duplicate (MS/MSD), and one trip blank (TB) sample. No ambient blanks were collected. During the initiation of this project, it was determined that ambient blanks were not necessary due to the absence of a source at these sites.

All samples were collected by Parsons and analyzed by APPL, Inc. following the procedures outlined in the Statement of Work and CSSA QAPP, Version 1.0. Samples in this SDG were shipped to the laboratory in a single cooler, which was received by the laboratory at a temperature of 2.0ºC.

SAMPLE IDs AND REQUESTED PARAMETERS

Sample ID	Matrix	VOCs	Metals	Mercury	Comments
TB-1	Water	X	X	X	Trip blank
CS-13	Water	X	X	X	MS/MSD
CS-12	Water	X	X	X	
CS-12 FD	Water	X	X	X	Field duplicate of CS-12
CS-1	Water	X	X	X	
CS-10	Water	X	X	X	

EXTRACTION, ANALYTICAL, AND REPORTING DETAILS

Parameter	Matrix	Prep Method	Analytical Method	Units
VOCS	WATER	SW5030B	SW8260B	µg/L
Metals	WATER	3010A	SW6010B	mg/L
Mercury	WATER	SW7470A	SW7470A	mg/L

EVALUATION CRITERIA

The data submitted by the laboratory has been reviewed and verified following the guidelines outlined in the CSSA QAPP, Version 1.0. Information reviewed in the data package included sample results; field and laboratory quality control samples; calibrations; case narratives; raw data; chain-of-custody (COC) forms and the sample receipt checklist. The findings presented in this report are based on the reviewed information, and whether the guidelines in the CSSA QAPP, Version 1.0, were met.

VOLATILES

General

The volatiles portion of this data package consisted of six (6) water samples that include four (4) groundwater samples, one (1) field duplicate, and one (1) trip blank. All samples were collected on June 11, 2018 and analyzed for a reduced list of VOCs which included: *cis*-1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride.

The VOC analyses were performed using United States Environmental Protection Agency (USEPA) SW846 Method 8260B. The samples were analyzed in one analytical batch, #230478 under one initial calibration (ICAL). All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery (%R) obtained from the laboratory control spike (LCS) sample, MS/MSD, and the surrogate spikes. Sample CS-13 was designated as the MS/MSD on the COC.

All LCS, MS/MSD, and surrogate spike recoveries were within acceptance criteria.

Precision

Precision was evaluated using the relative percent difference (RPD) obtained from the MS/MSD results. Precision was further evaluated by comparing the field duplicate analyte results. Sample CS-12 was collected in duplicate.

All MS/MSD RPDs were within acceptance criteria.

All FD/parent sample results were non-detect; therefore, RPD could not be evaluated.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining laboratory blank and TB for cross contamination of samples during sample collection, transportation, and analysis.

All samples in this data package were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0. All samples were prepared and analyzed within the holding time required by the method.

- All instrument performance check criteria were met.
- All initial calibration criteria were met.
- All initial calibration verification (ICV) criteria were met. The ICV was prepared using a secondary source standard. All second source verification criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- All internal standard criteria were met.

There was one method blank associated with the VOC analyses in this SDG. The MB was non-detect for all target VOCs.

There was one trip blank sample associated with the VOC analyses in this SDG. The TB was non-detect for all target VOCs.

Completeness

Completeness has been evaluated in accordance with the CSSA QAPP. The number of usable results has been divided by the number of possible individual analyte results and expressed as a percentage to determine the completeness of the data set.

All VOC results for the samples in this SDG were considered usable. The completeness for this SDG is 100%, which meets the minimum acceptance criteria of 95%.

ICP-AES METALS

General

The ICP-AES portion of this SDG consisted of five (5) water samples that includes four (4) groundwater samples, one (1) field duplicate. All samples were collected on June 11, 2018. All samples were analyzed for arsenic, barium, cadmium, chromium, copper, lead, and zinc.

The ICP-AES metals analyses were performed using USEPA SW846 Method 6010B. All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method.

The samples for ICP-AES metals were digested in batch #231253. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS, MS and MSD. CS-13 was designated as the parent sample for the MS/MSD analyses.

All LCS, MS, and MSD recoveries were within acceptance.

Precision

Precision was measured based on the %RPD of MS/MSD results and parent/FD sample results. Sample CS-12 was collected in duplicate.

All %RPDs were compliant for the MS/MSD.

The following metals were detected above the reporting limit (RL) and met RPD criteria, except for copper, as follows:

Metal	Parent (mg/kg	FD (mg/kg)	%RPD	Criteria (%RPD)
Barium	0.0342	0.0327	4.5	≤20
Copper	0.003 U	0.021	NC	≤20

Since copper was not detected below the RL of 0.010 mg/L in the parent sample and was detected at over 2 time the RL in the field duplicate sample, the data validator used professional judgement and qualified the copper results in both the parent and FD as estimated with a "J/UJ".

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating preservation and holding times; and
- Examining laboratory blank for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0, prepared and analyzed within the holding time required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All CCV criteria were met.

- All interference check (ICSA/ICSAB) criteria were met.
- Dilution test (DT) was analyzed on same sample as the MS/MSD (CS-13) and was not applicable since all target metals met criteria in the MS/MSD.
- Post digestion spike (PDS) was analyzed on the same sample as the MS/MSD and DT. All target metals met criteria in the MS/MSD; therefore, the PDS analysis was not applicable.
- One method blank and several calibration blanks were analyzed in association with the ICP-AES analyses in this SDG. The method blank was free of target metals at or above the RL.
- The initial calibration blank (ICB) and one of the continuing calibration blank (CCB) samples reported a trace amount of arsenic. No corrective action was necessary since there was no arsenic detected in any of the field samples.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All ICP-AES metals results for the samples in this SDG were considered usable. The completeness for the ICP metals portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

MERCURY

General

The mercury portion of this SDG consisted of five (5) water samples that includes four (4) groundwater samples, one (1) field duplicate. All samples were collected on June 11, 2018 and were analyzed for mercury.

The mercury analyses were performed using USEPA SW846 Method 7470A. These samples were analyzed following the procedures outlined in the CSSA QAPP, prepared and analyzed within the holding time required by the method.

The mercury samples were prepared in batch #230927. The analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS, MS, and MSD. CS-13 was designated as the parent sample for the MS/MSD analyses.

All LCS, MS, and MSD recoveries were within acceptance.

Precision

Precision was measured based on the %RPD of MS/MSD results and parent/FD sample results. Sample CS-1 was collected in duplicate.

The %RPD of MS/MSD was compliant.

Mercury was not detected in the parent and FD sample.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, prepared and analyzed within the holding times required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All calibration verification criteria were met.

There was one method blank and several calibration blanks associated with the mercury analyses in this SDG. All blanks were free of mercury at or above the RL.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

Mercury result for the samples in this SDG was considered usable. The completeness for the mercury portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.